Inequality from bibliometric perspective

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* The opinions expressed in this presentation are those of the author and do not necessarily reflect the views of his employing institution
Bibliometrics

• Bibliometric techniques could benefit from data reinterpretations based on social theory and thus provide new ways of looking at the social world, contributing towards the development of alternative theories.
The notion of inequality

- Well-known constructs of social inequality and economic inequality
- Inequality as an inherent characteristic of scientific or innovation systems (see e.g.: Merton’s work on Matthew’s law)
- Can we talk about „bibliometric inequality“ or inequality observed by means of bibliometric data?
Social and economic inequality

Social inequality
- uneven distribution of resources
- privileges some individuals or organizations
- attributed to certain social institutions, norms of allocation, distributive standards

Economic inequality
- sub-type of social inequality
- concerns the distribution of wealth

The essence of inequality problem
- inequality of opportunities - not rejecting the premise that distribution of resources could be uneven
Sources of inequality

Social status is based on:

- **ascribed characteristics**
  - occurring naturally, resulting from birth, location, gender identity, status of parents
  - *e.g. country in which a given scientific institution is located*

- **achieved characteristics**
  - earned or chosen, *e.g.* education, marital status, professional achievements, becoming "nouveau riche"
  - *e.g. co-authorship with distinguished scientists, breakthrough research*

- **Problem of limited social mobility**
  - achieved characteristics might not be sufficient to overcome inequalities
  - public discourse solidifies inequalities ("meta-narratives" and alternative voices)

- **Cultural capital** — social assetts promoting social mobility, going beyond mere economic conditions (Pierre Bourdieu)
  - *e.g. command of English, access to research infrastructures, international recognition or accreditation*
„Inequality” as previously known in bibliometric studies

„Scientometrics”, 1978-2016

• 27 articles referring to „inequality” in title, abstract or keywords (0.49% of all journal’s articles)
  – 1978-1989: 3
  – 1990-1999: 3
  – 2000-2009: 9
  – 2010-2016: 12

• „Inequality” as difference in outputs („output inequality”), comparison of scientific productivity (distribution of, concentration of, dispersion of)

• Different from the use of the term in social sciences

• Limited reflection on whether the inequality could be a problem for innovation systems
Bibliometric studies on inequality

- stratification of esteem in science; co-authorship influences reputation but leads to „misallocation of credit”

- overview of quantitative measures of inequality

- inequality in research outputs (publications and citations)

- impact of New Public Management, university rankings and competition on academic publishing practices; increasing homogeneity of universities

- inequality of outputs compared with inputs: R&D funding versus publications and citations

- comparison of performance indicators across multiple institutions

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Attempts at defining bibliometric inequality

Bibliometric inequality
• uneven opportunities to publish and get cited
• privileges some individuals or organizations
• attributed to certain social institutions, norms of allocation, distributive standards

Gender  Age  Ethnic  Geographical
Possible research questions

• „Bibliometric mobility barriers” - is the ascribed „bibliometric status” reversible?
  – Chinese science and the „nouveau riche” analogy
    • applicability to other countries; coping strategies
  – barriers could change over time, e.g. solidify
    • „Red Queen game” – „now, here, you see, it takes all the running you can do, to keep in the same place”
    • window of opportunities opening and closing
  – linkage between low status and low self-esteem
    • self-fulfilling prophecies analogous to „cycles of poverty”
Possible research questions

• „Bibliometric mobility barriers” - is the ascribed „bibliometric status” reversible?
  – investigations of increased prestige of institutions with unfavourable ascribed characteristics
    • potential and limitations of organisational efforts
  – desirable types of cultural capital
    • overly simplistic assumptions: scientific skills, command of English, research infrastructures, R&D budgets, networking
    • EU-13 countries and many non-EU countries somehow fail to capitalize on investments and research efforts
    • many measurements and comparisons – not enough insights, and strong promotion of organisational isomorphism
    • the „holy Grail” of Research & Innovation policies?
Possible research questions

• Is „bibliometric inequality” good or bad for innovation systems?
  – the concept of Smart Specialisation Strategies highlighting and strengthening inequalities
  – cohesion contrasted with scientific excellence
  – the acts of exclusion and inclusion (e.g. evaluation criteria)
  – obsession with rankings, relying on relatively simple bibliometric indicators
  – gate-keepers – companies supplanting academic publishers

• Analogy: inequalities constrain economic growth and excessive inequalities are destructive for any system
  – „level playing field” – correcting inequalities resulting from ascribed characteristics through policies (distributive justice)
Ideologies of inequality

• „Funding is distributed on the basis of merit”
• „We should never, never, never, never move the proposal assessment criteria away from excellence to reduce participation disparity”
• Hidden assumption of unrestricted competition
• Existing position assumed to be resulting from past and present merits
• Paternalism to „spread and widen” the support to „charity cases”
Inequalities in scientific production and impacts

- Entry conditions (ascribed and achieved characteristics, cultural capital)
- Incentive systems (R&D strategies, R&D competitive funding)
- Competitive opportunities (social system research topics, peers, new journals, technologies...)
- Social structure of scientific excellence (ascribed and achieved characteristics)

Research → Papers → Publications → Citations
Snapshot 1: emerging technologies

- Emergence of new technologies or research topics could reshuffle the social system
  - But does it?
  - Maybe the inequalities are solidified due to the deficiencies of innovation systems and lack of targeted interventions?
Example of graphene research

• Emerging research topic with significant commercial implications

• Attracting attention of researchers from most countries in the world
  – increased density of co-authorship networks, decreasing geodesic distances and increasing betweenness centrality

• Over time, the newly established social system solidified and was once again dominated by players that enjoyed the traditionally strong scientific status

Herfindahl index - degree of concentration (for countries publishing about graphene)


window of opportunity?
Theil entropy index – inequality in the distribution of citations among countries


egalitarian versus elitists research field
Authorship and affiliations

• Problem of affiliations: first affiliation of authors, correspondence address
• Significantly different counts of publications
• Implications for constructing bibliometric rankings, including full or fractional counting
Snapshot 2: Research & Innovation funding programmes

- R&I funding programmes could reduce inequalities
  - But do they?
  - Maybe the programme design intentionally promotes inequalities?
Excessive concentration?


- **EU-13 countries** received **4.68%** of Horizon 2020 budget
- **Non-EU countries** received **6.56%** of Horizon 2020 budget
- **A single organisation** from EU-15 received **57.79%** of funding awarded to **all EU-13**
EU-13 versus EU-15

EU-13 invests proportionally more in R&D in relation to received H2020 funding
EU-13 versus EU-15

Most EU-13 perform better than EU-15 in scientific publications, citations received, patents and hightech exports in relation to how much they receive in H2020 funding.
H2020 deepens the chasm

(thickness of a line = number of joint H2020 projects)

• **EU-15 countries** intensify their **cooperative ties**
• No incentives to **include EU-13** partners in project consortia (*the only exception: EIT RIS scheme for KICs*)
• **Assortative mating** – marrying people with similar background (rises mobility barriers)
Dense networks of H2020 participations of sample EU-15 members

EU-13 countries **not included in most H2020 consortiums** as opposed to EU-15 and non-EU partners
FP7 versus H2020: EU-15 better off, EU-13 worse off in average funding per project.

Source of data: Stairway to Excellence report Poland, EC JRC-IPTS 2015, pp. 22-23

Average EC contribution per project in FP7, kEUR
Average EC contribution per project in H2020, kEUR
The problem of access and exclusion - European Technology Platforms (ETPs)

• Recognised by the EC as official representation of R&I stakeholders in the EU
• Prominent role in **setting H2020 research agendas**
• 41 ETPs, 36 publish data on governance
• **Governance bodies** of these 36 platforms:
  – Only 9 out of 36 include members from EU-13 countries, but 10 have non-EU members
  – Only 5.88% of all members of governance bodies (N=833) come from EU-13 countries
• Even more than assortative mating – endogamy: practice of marrying within a specific group
Snapshot 3: Open access

- Open access promoted to facilitate openness and equal access to scientific knowledge
  - But it solidifies the existing social structure of international science and introduces new mobility barriers
  - Limited opportunities to contribute for many scientists: expensive publishing fees, redirection of R&D funding towards publications
Conclusions

• Applicability of the notion of inequality to bibliometrics
• Need for research on factors reducing bibliometric mobility barriers
• Need for discussion about relation between inequality and performance of R&I systems
• Practical challenges for moderate R&I performers
• Novel methodological approach combining bibliometrics with the insights from social theory